

***Conservation Assessment  
for  
Douglas Hawthorn (Crataegus douglasii ) Lindley***



*Marion Ownbey Herbarium*

***USDA Forest Service, Eastern Region***

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Jan Schultz  
2727 N. Lincoln Rd  
Escanaba, MI 49829  
906-228-8491



*This Conservation Assessment was prepared to compile the published and unpublished information about Crataegus douglasii. This is an administrative study only and does not represent a management decision or direction by the U.S. Forest Service. Although the best scientific information available was gathered and reported in preparation for this document, then subsequently reviewed by subject experts, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if the reader has information that will assist in conserving the subject taxon, please contact the Eastern Region of the Forest Service Threatened and Endangered Species Program at 310 Wisconsin Avenue, Milwaukee, Wisconsin 53203*

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### Editorial Committee

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## EXECUTIVE SUMMARY

This Conservation Assessment is a review of *Crataegus douglasii* Lindley (Douglas hawthorn) in the United States and Canada. The main range of *C. douglasii* is in the western United States, however, disjunct populations occur in the upper Great Lakes Region in Michigan, Minnesota, and Ontario. The occurrence in Wisconsin is likely introduced (Judziewicz & Koch 1993).

*Crataegus douglasii* (listed without variety status) has a Global Heritage Status Rank of G5 (apparently secure). *Crataegus douglasii* var. *douglasii* has a Global Heritage Status Rank of G5/T4 indicating that Globally it is considered secure, but especially at the edge of its distribution it may be somewhat susceptible. It is designated as a Regional Forester Sensitive Species (RFSS) in Michigan's Hiawatha National Forest and Minnesota's Superior National

Forest (USDA 2000a).

*Crataegus douglasii* is listed as a Special Concern species in Michigan. This species has 109 documented element occurrences (EOs) in Michigan (Ed Schools, pers. comm., 2002) and has been reported from eight counties in the Upper Peninsula (including Isle Royale) and in one northern Lower Peninsula county (Voss 1985; MNFI 2001). However, almost half of the element occurrences for Michigan are 1950 or before. *Crataegus douglasii* is best represented from the Keweenaw Peninsula (MNFI 2002). There are five current locations from the Pictured Rocks National Lakeshore in Alger County. On the Hiawatha National Forest, *C. douglasii* is known from only one location in Alger County (MNFI 1994).

In Minnesota, *Crataegus douglasii* is listed as a threatened species. Fifteen EOs of *C. douglasii* have been documented in northern Minnesota from two counties (MN NHP 2000) including nine locations within the proclamation boundary for the Superior National Forest (Ed Lindquist, pers. comm., 2002).

Potential threats to *Crataegus douglasii* plants disjunct in the northern Great Lakes Region include severe insect infestations (Coffin & Pfannmuller 1988; Gerdes & Saltzmann 1995), succession (Phipps & Muniyamma (1980), trampling (USDA 2000b) and timber harvest (Welby Smith pers. comm. 2002). One of the greatest threats to *C. douglasii* may be failure to identify these thorny shrubs as rare plants and its subsequent eradication in recreational areas and elsewhere (Ed Voss, pers. comm. 2001).

Long-term monitoring of *Crataegus douglasii* populations is needed, specifically on plants growing in the northern Great Lakes Region. Research on its biology and ecology, including habitat requirements is needed as well.

## INTRODUCTION/OBJECTIVES

One of the conservation practices of the USDA Forest Service is designation of Regional Forester Sensitive Species (RFSS). The Eastern Region (R9) of the Forest Service updated its Sensitive Species list on February 29, 2000 (USDA 2000a). Part of that process included identification of priority species for conservation assessments and strategies. *Crataegus douglasii* was one of those identified priorities.

The objectives of this document are to:

- Provide an overview of the current scientific knowledge
- Provide a summary of the distribution and status range wide and within the Eastern Region of the Forest Service
- Provide the available background information needed to prepare a subsequent Conservation Strategy.

The National Forest Management Act and U.S. Forest Service policy require that Forest Service lands be managed to maintain viable populations of all native plant and animal species. A viable population is one that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its range within a given planning area (FSM 2670.5.22). In addition to these species listed as

Endangered or Threatened under the Endangered Species Act (ESA), or species of Concern by U.S. Fish and Wildlife Service, the Forest Service lists species that are sensitive within each Region (RFSS).

*Crataegus douglasii* is listed as Regional Forester Sensitive in Region 9, the Eastern Region of the U.S. Forest Service, for Michigan's Hiawatha and Minnesota's Superior National Forests (USDA 2000a). The objectives of management for sensitive species is to ensure their continued viability throughout their range on National Forest lands and to ensure they do not become threatened or endangered because of Forest Service actions (FSM 2670.22).

## NOMENCLATURE AND TAXONOMY

<b>Scientific Name:</b>	<i>Crataegus douglasii</i> Lindley
<b>Common Names:</b>	Douglas hawthorn, black hawthorn
<b>Family:</b>	Rosaceae
<b>Synonyms:</b>	<i>C. brockwayae</i> Sargent [refers to only plants of Michigan and Ontario (Marquis & Voss 1981)]

Note: The word *Crataegus* comes from the Greek word *kratos* meaning strength, referring to the strength of the wood of this genus (Pojar & Mackinnon 1994). The specific epithet of *Crataegus douglasii* is named after David Douglas (1798-1834) who collected plant specimens primarily in the Pacific Northwest, but also in southern Ontario (Soper & Heimburger 1982).

According to Gleason & Cronquist (1991), there are three subfamilies in Rosaceae. *Crataegus douglasii* is in the subfamily Pomoideae, members of which are woody plants, have inferior ovaries, and fruits that are pomes (Voss 1985).

Plants of the genus *Crataegus* are not difficult to recognize. Within the genus, however, it is taxonomically complex due to hybridization, polyploidy, and apomixis (Voss 1985). [Apomixis is seed set without fertilization (Harris & Harris 1994)]. Voss (1985) discusses the early history of *Crataegus*. Between 1900 and 1925 over 1000 species were described for North America. Over 700 species them were described by C.S. Sargent, Director of the Arnold Arboretum; many of the remaining species were described by W.W. Ashe and C.D. Beadle, both of North Carolina. E.J. Palmer studied *Crataegus* from 1921-1946 at Arnold Arboretum where he examined over 30,000 specimens. In 1946 he published a new listing of species reducing many of the names to synonymy (Voss 1985). In 1957 Voss sent Palmer 1200 Michigan specimens for annotation. Palmer was the primarily authority Voss consulted although he also consulted E.P. Kruschke's work on *Crataegus* in northern United States and adjacent Canada. Voss (1985) describes 45 species of *Crataegus* in Michigan.

The Section *Douglasii* Loud. consists of three taxa, all of which have mature blue-black fruit, the key character which separates this section from all other *Crataegus* species (Voss, pers. comm., 2001). These three taxa are either considered varieties of *C. douglasii* (Hitchcock *et al.* 1961) [*C. douglasii* var. *douglasii*, *C. douglasii* var. *suksdorfii*, and *C. douglasii* var. *rivularis*] or as individual species (Kruschke 1965). Another variety of *Crataegus douglasii* (var. *duchesnensis* Welsh) is listed in NatureServe (W-1) as occurring in Utah. Of these three western United States taxa, only *C. douglasii* var. *douglasii* is disjunct in the northern Great

Lakes area.

Kruschke (1965) suggested that *Crataegus douglasii* var. *douglasii* and *C. douglasii* var. *suksdorfii* were distinct enough to designate the var. *suksdorfii* as a separate species [*C. suksdorfii* (Sarg.) Kruschke] basing his decision on differences in stamen numbers (Brunsfield and Johnson 1990). Both *C. douglasii* var. *douglasii* and *C. douglasii* var. *rivularis* have 10 stamens, while *C. douglasii* var. *suksdorfii* has 20 (Brunsfield & Johnson 1990).

*Crataegus douglasii* var. *suksdorfii* is restricted to a narrower range of habitats than *C. douglasii* var. *douglasii*. *C. douglasii* var. *suksdorfii* occurs in mesic sites while *C. douglasii* var. *douglasii* occurs in both mesic and drier sites. It is often the case that diploid species have a narrower habitat range than their tetraploid relatives (Stebbins 1971). Other differences between these two taxa are described in Brunsfield and Johnson (1990).

Dickinson and co-workers have proposed that the tetraploid *Crataegus douglasii* var. *douglasii* may have been derived from the diploid var. *suksdorfii* through a “switch to apomixis with a concomitant loss of a whorl of stamens” (Love 1997). This may occur and continue to occur spontaneously when plants are exposed to environmental stresses at different sites and times (Love 1997). Steve Brunsfield (cited in Love 1997) suggests that *Crataegus douglasii* may have originated through hybridization of *Crataegus suksdorfii* and *Crataegus columbiana*.

## DESCRIPTION OF SPECIES

Note: The description below for *Crataegus douglasii* was compiled from several regional floras (Soper & Heimburger 1982; Voss 1985; Gleason & Cronquist 1991) which describe plants growing in Ontario, Michigan, and the northeastern United States and adjacent Canada, respectively. Floras from the western regions of the United States and Canada were not included as some of the measurements and characteristics for the western plants of this species may not apply to those disjunct plants in the northern Great Lakes Region.

<b>Life Form:</b>	Small tree or treelike shrub; up to 12 m tall
<b>Bark:</b>	Greyish-brown, with scales on more mature stems
<b>Twigs:</b>	Without hairs; a few short thorns (1-2.5 cm) or lacking thorns
<b>Leaves:</b>	Deciduous, alternate, simple; broadly elliptic to oblong-obovate, with 2-4 pairs of lobes; on vegetative shoots, leaves more deeply indented; somewhat leathery; upper surface dark-green and shiny, paler on underside of leaf; serrated leaf edges with teeth that are gland-tipped.
<b>Flowers:</b>	Cymose; about 5-12 flowers; 1-1.3 cm wide petals about 5 mm in length; stamens 10
<b>Fruits:</b>	Dark purple to black when ripe; 0.8-1 cm in diameter; 3-5 nutlets; large pit on inner part

## Identification Notes

*Crataegus douglasii* is the only *Crataegus* species in the northern Great Lakes Region with fruits that are purple to black when mature (Gleason & Cronquist 1991). Soper & Heimbürger (1982) note that the immature fruit of *Crataegus douglasii* often turns black upon drying especially just below the turned-down calyx lobes. The color of fruits and flowers can be misleading with herbarium specimens; immature fruits of other *Crataegus* species may also turn black upon drying so identifying herbarium species on the basis of black fruits may not be accurate. Voss (1985) suggests that collecting both flower and fruit is important to identify many species of *Crataegus*. Voss (pers. comm. 2001) suggests permanently marking trees from which specimens are obtained, that way one can be sure of getting fruits from the same tree from which flowers were obtained. On mounted herbarium specimens, Voss suggests noting the color of the flowers fresh anthers, and with fruiting specimens, recording the color, texture, and size of fully ripe fruit.

Phipps & Muniyamma (1980) observed that *Crataegus douglasii* has the shortest thorns (<3 cm) of all of the native *Crataegus* species known to occur in Ontario (*C. monogyna*, an introduced species, has thorns that are <1 cm). Gleason & Cronquist (1991) note that the thorns of *C. douglasii* are 1-2.5 cm long.

## HABITAT AND ECOLOGY

Element occurrence records for *Crataegus douglasii* for Michigan, Minnesota, and Wisconsin are in Appendix A and include habitats and associated species when indicated.

### *Crataegus* species in general

The following information applies to *Crataegus* species in general but may or may not apply specifically to *Crataegus douglasii*.

Members of the *Crataegus* genus are colonizers of sites with a high amount of light (W-2; Ohmann 1979) and where soil is exposed (W-2). *Crataegus* seeds may be dispersed long distances by birds and large mammals (Phipps & Muniyamma 1980). Many *Crataegus* species are known to quickly invade old fields and inadequately managed pastures (Phipps & Muniyamma 1980). According to Ohmann (1979), *Crataegus* species occur mainly on sites affected by humans such as along fences, roads, in waste ground, and unused pastures.

### Western occurrences

Information in this section refers to plants of *Crataegus douglasii* occurring in the western United States. In some cases, it is not clear from the article/website whether or not *C. douglasii* includes the taxa *C. suksdorfii* and *C. rivularis*. Because there is not much information about habitat and ecology specific to the disjunct *C. douglasii* plants in the northern Great Lakes Region, information for western plants is included. However, the information on *C. douglasii* from the western United States may not be applicable to those



disjunct plants in Michigan, Minnesota, and Ontario.

*Crataegus douglasii* occurs in a variety of habitats in the western United States from moist sites, such as edges of stream and bottomlands, to drier upland sites, both forested and nonforested (Brunsfeld & Johnson 1990). This early to mid successional species does not tolerate heavy shade (Vance *et al.* 2001). In the western states, *Crataegus douglasii* typically grows as an understory shrub within sites dominated by black cottonwood (*Populus trichocarpa*), eastern cottonwood (*P. deltoides*), quaking aspen (*P. tremuloides*), or ponderosa pine (*Pinus ponderosa*). However, in open areas it may also be found in pure stands with an understory of Woods' rose (*Rosa woodsii*) and chokecherry (*Prunus virginiana*) (Habeck 1991). According to a report on Montana riparian sites, this species often forms impenetrable thickets along rivers or in open areas and is usually not found in disturbed areas (Hansen *et al.* 1988). In Washington, growth of *C. douglasii* is inhibited by floods, fires, or other soil disturbance (Daubenmire 1970). In the western United States, *Crataegus douglasii* usually grows on finely-textured soils that are moist and deep (Habeck 1991). In the Pacific Northwest, *C. douglasii* appears to have a preference for soils high in nitrogen (Vance *et al.* 2001).

*Crataegus douglasii* is tolerant of fires (Daubenmire 1970) and can resprout or sucker-root after fire damage that destroys its aboveground portion (Hansen *et al.* 1988). [Sprouting and suckering occurs in *Crataegus* species whether or not there is damage to the aboveground portion according to Ed Voss (pers. comm., 2001); but the plant's ability to sucker would allow it to recover more quickly.] Frequent fires may limit the range of this species. Daubenmire (1970) speculated that the reason *C. douglasii* was able to expand its range in eastern Washington was as a result of the revised agricultural practice of not burning stubble. With reduction in the number and size of fires, thickets of this species has come back from stump sprouts.

In various parts of the western United States, birds, such as sharp-tailed grouse (Marks & Marks 1988), and animals, such as mule deer, small mammals (Austin & Hash 1988), and cattle (Habeck 1991) feed on fruits and/or stems of *Crataegus douglasii*. Referring to *C. douglasii* in Alaska, the fruits are "sweetish and mealy but somewhat insipid" (Viereck & Little 1972). Nutritional values (including percentages of protein, lipids, calcium, etc.) of fruits of this species from southeastern Washington are listed in Piper (1986). This species provides cover to various wildlife species including nesting/brooding cover for birds (Marks & Marks 1988).

Many parts of *Crataegus douglasii* plants has been utilized by humans for food, medicine, implements (fishing, weapons, tools), etc. (Pojar & Mackinnon 1994).

### **Disjunct occurrences in the northern Great Lakes Region**

Disjunct populations of *Crataegus douglasii* occur primarily in the vicinity of Lake Superior or Lake Huron where the climatic effect of the Lakes likely provides an important element of *C. douglasii*'s habitat (Coffin & Pfannmuller 1988). It occurs in various habitats including, but not limited to, margins and openings in woods, on shores, and rocky summits.

## Michigan

In Michigan, *Crataegus douglasii* “grows almost anywhere except wet sites” and occurs usually on “thin, rocky, often sandy soils” (Ed Voss, pers. comm., 2001). This species occurs on edges of woods, in woodlands, on rocky bluffs, and in thickets on shores and sand dunes (Voss 1985).

*Crataegus douglasii* occurs in thickets in the interior of Michigan’s Keweenaw Peninsula where it is locally abundant (Ed Voss, pers. comm., 2001). Houghton County has 11 element occurrences from the 1950’s and 5 pre-1950’s occurrences. Keweenaw County has 16 occurrences from pre-1952 and another 7 occurrences from the 1970’s. Isle Royale accounts for another 20+ occurrences (MNFI 2002). *Crataegus douglasii* also occurs on a sand dune bluff in Pictured Rocks National Lakeshore where it forms thickets at the edge of deciduous woods; sand is a “secondary factor” (Ed Voss, pers. comm., 2001).

Emmet Judziewicz listed several habitats for *Crataegus douglasii* on Isle Royale.

1. Open, rocky, often weedy, and previously burned ridgetops under *Betula papyrifera*, *Betula alleghaniensis*, and *Populus tremuloides*.
2. Weedy, open habitats on sandy or gravelly postglacial beach ridges.
3. Present beaches.

The microhabitat provided by Lake Superior could be a factor as many of the element occurrences appear to be clustered in areas influenced by the colder air of Lake Superior. In addition, many of the more southern locations are from the 1930’s or earlier. Additional field work is needed to determine whether these populations are still extant or if they have been lost either to global warming or development.

The one occurrence of *Crataegus douglasii* documented on the Hiawatha National Forest is in a campground where much of the area is mowed grass and harbors many non-native species (Gerdes & Saltzmann 1995; MNFI 1999). Other disturbed sites where this species occurs (Houghton County) are along roadsides, edges of clearings, and rocky expanses with little soil (Janet Marr, pers. comm., 2002). Some of these clumps grow in open, exposed sites while others occur in moister, shadier sites (Janet Marr, pers. comm., 2002). In Baraga County an element occurrence from 1969 is described as an old abandoned apple orchard (MNFI 2002).

## Minnesota

In Minnesota, 2/3 of the *Crataegus douglasii* sites are known to occur in upland boreal forests on bedrock outcrops, openings created by windthrows, or forest edges such as along streams and lakes (USDA 2000b). Plants growing on outcrops are probably in moist cracks (Lynden Gerdes, pers. comm., 2002). Although this species occurs in several old growth sites in Minnesota, it does not appear that it depends on any particular forest stage or age (USDA 2000b). The important factor appears to be that an opening in the canopy is present. Open habitat in forests may be maintained by blowdowns, fire, or other disturbance.

About 1/3 of the *Crataegus douglasii* sites are known to occur on riverbanks and nearly 1/3 of these riverbank habitats have very rocky banks (USDA 2000b). Occasional flooding and beaver activity along the banks may maintain open riverbank habitat for this species.

Almost all of Minnesota's known occurrences of *Crataegus douglasii* are within 2-3 miles of Lake Superior (USDA 2000b). Lawson Gerdes (pers. comm., 2002) noted that at least one occurrence was found recently in Minnesota along a creek five miles inland from Lake Superior.

## Ontario, Canada

In Ontario, *Crataegus douglasii* occurs "in thickets, along margins of woods, lakeshores, and river banks, on summits of cliffs and rocky ridges" (Soper & Heimbürger 1982).

## DISTRIBUTION AND ABUNDANCE

*Crataegus douglasii* occurs throughout the northern part of the Rocky Mountains, west to Puget Sound and the Columbia River Gorge, and disjunct to Michigan, Ontario (Hitchcock *et al.* 1961), Minnesota (Coffin & Pfannmüller 1988), and Wisconsin, where it was likely introduced (Judziewicz & Koch 1993). These disjunct populations in the Upper Great Lakes Region are mostly restricted to the vicinity of Lake Superior and Lake Huron (Marquis & Voss 1981). It also occurs north of Lake Superior at Ontario's Lake Nipigon and Lake Abitibi (Soper & Heimbürger 1982). All collections of *C. douglasii* from the southern Lake Superior shoreline are from islands or peninsulas: Thunder Bay, Manitoulin, Bois Blanc, and Sugar Island in the St. Mary's River (Ed Voss, pers. comm., 2001). This species occurs on the Bruce Peninsula and over a dozen sites along the northern shore of Lake Superior (Soper & Heimbürger 1982).

## Michigan

Voss (1985) states that 19 species of *Crataegus* constitute the vast majority of specimens known from Michigan. *Crataegus succulenta* and *C. macrosperma* are common throughout Michigan. Others that are reasonably common in the Upper Peninsula and northernmost Lower Peninsula are *C. chrysocarpa*, *C. irrasa*, and *C. douglasii*. Another 14 *Crataegus* species are listed as fairly common but these species occur mostly or entirely in the Lower Peninsula.

There are 109 element occurrence records of *Crataegus douglasii* for Michigan (Ed Schools,

pers. comm., 2002) in eight Upper Peninsula counties [Alger, Baraga, Chippewa, Houghton, Keweenaw (including Isle Royale), Mackinac, Marquette, Ontonagon] and one county (Alpena) in the Lower Peninsula (Voss 1985; MNFI 2001). After examining the MNFI records, it becomes apparent that almost half of these element occurrences are from 1950 or before.

Alpena County in the Lower Peninsula has five occurrences from the 1930's and two from 1895. All Mackinac County occurrences reported by C.K. Dodge were collected in 1913. Similarly, K.M. Wiegand and M.C. Wiegand made nine collections from Marquette County in 1937. Without further field work it is not known if these plants continue to exist in these previously reported counties. It might be that *Crataegus douglasii* is currently known from just six upper peninsula counties (Alger, Baraga, Chippewa, Houghton, Keweenaw, and Ontonagon).

*Crataegus douglasii* can be locally common, such as near Delaware in Keweenaw County (Voss 1985) as well as just north of Houghton in Houghton County (Janet Marr, pers. comm., 2002). The greatest number of documented element occurrences are from Keweenaw County (7 current, 16 from 1950's or before), 20+ from Isle Royale, and Houghton County (11 from 1950's, 5 from 1935-1936).

Several specimens have been collected from the Pictured Rocks National Lakeshore in Alger County (Read 1975). On the Hiawatha National Forest, there is only one documented occurrence of *Crataegus douglasii* (MNFI 1994). Its occurrence rank at this HNF site is D (poor) (MNFI 1999), in part, because of its occurrence is in an established campground (Gerdes & Saltzmann 1995). There is a historical site on Grand Island substantiated by specimens collected by C.K. Dodge in 1916 (Ed Voss, pers. comm., 2001).

## **Minnesota**

Minnesota Natural Heritage Program (2000) listed 15 element occurrence records for *Crataegus douglasii* from Cook and Lake counties. There are 22 specimens of this species from Cook County and five from Lake County housed at the University of Minnesota herbarium (W-3); some of the additional specimens could be later finds; others are likely duplicate specimens. Most of these occurrences are located within about 2-3 miles of Lake Superior; one site has been found 5 miles inland from Lake Superior (USDA 2000b; Lawson Gerdes, pers. comm., 2002). The majority of these occurrences are within public lands and within the proclamation boundary of the Superior National Forest, so although they are of limited distribution in Minnesota, this species was considered fairly secure at the time of the Superior National Forest's Risk Assessment.

There are nine occurrences within the proclamation boundary for the Superior National Forest (Ed Lindquist, pers. comm., 2002), three in the Grand Portage Reservation, and several in Finland State Forest and various state parks (MN HNP 2000).

Many sites in Minnesota for *Crataegus douglasii* are listed as having a single or just a few plants. Several sites had 10-20 individuals; the site with the most individuals had 50+ plants (MN HNP 2000).

## Wisconsin

According to Judziewicz & Koch (1993), the only two known locations for *Crataegus douglasii* in Wisconsin are on the Apostle Islands (Madeline and Raspberry), where it may have been introduced.

## Ontario, Canada

In Ontario, *Crataegus douglasii* occurs along Lake Superior's north shore and along the northeastern part of Lake Huron on the Bruce Peninsula and Manitoulin Island (Soper & Heimburger 1982). To the north, it is known to occur at Lake Nipigon and Lake Abitibi.

During presettlement times in Ontario, numbers of individuals of the genus *Crataegus* were very likely much lower than at present (Phipps & Muniyamma 1980). Populations expanded as agricultural areas opened in Ontario. *Crataegus* colonized pastures that were poorly managed or no longer used as well as along fence and field edges. No reference was made to *C. douglasii* specifically in this citation.

## PROTECTION STATUS

Currently, the official status of *Crataegus douglasii* with respect to Global, Federal and State Conservation Status is as follows. Note: NatureServe also has *Crataegus douglasii* var. *douglasii* with rank of G5/T4 (Generally secure but could be somewhat threatened at the edge of its distribution). Utah and Manitoba are not listed under *Crataegus douglasii* var. *douglasii*. Ranks for other states and provinces differ as well.

**U. S. Fish and Wildlife Service**      None

**Global Heritage Status Rank:**      G5

**U.S. Forest Service:**      Region 9 Sensitive on Hiawatha National Forest  
(MI) Superior National Forest (MN)

G5: Common, widespread and abundant globally (although it may be rare in parts of its range, particularly on the periphery). Not vulnerable in most of its range. Typically with considerably more than 100 occurrences and more than 10,000 individuals.

**National Heritage Status Rank, U.S (15 Oct. 1999):**      N5

**National Heritage Status Rank, Canada (8 Aug. 1993):**      N?

### Other states:

<b>Alaska</b>	S?	Oregon	SR
<b>California</b>	S4?	South Dakota	SR
<b>Idaho</b>	SR	Utah	S?
<b>Michigan</b>	S3S4	Washington	S?
<b>Minnesota</b>	S2	Wisconsin	SR
<b>Montana</b>	SR	Wyoming	SR

North Dakota	SR
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#### Canadian Provinces:

Alberta	S3	Ontario	S4?
British Columbia	S?	Saskatchewan	SR
Manitoba	SR		

S?: More research is needed to assess

S2: Rare, typically 5 to 20 occurrences; may be vulnerable to extirpation

S3: Rare or uncommon in State (21-100 occurrences).

S4: Common, apparently secure under present conditions; typically 51 or more occurrences, but

may be fewer with many large populations; usually not susceptible to immediate threats.

SR: Reported, but not assessed

## LIFE HISTORY

Although some comparisons are made between *Crataegus douglasii* and its western relative, *C. suksdorfii*, discussion in this section is mostly confined to those disjunct populations of *C. douglasii* in the northern Great Lakes Region. This is the region of concern for this Conservation Assessment and characteristics of western populations may not apply to these disjunct populations.

In Ontario, *Crataegus douglasii* flowers in June and fruits in September (Soper & Heimburger 1982). In Michigan, this species flowers in May/June (Billington 1949) and fruits ripen in August/September (Ed Voss, pers. comm., 2001, citing UMICH herbarium specimen labels).

Fruits of *Crataegus* species, referring to those of the Pacific Northwest, remain on the tree until winter and are dispersed by birds and mammals (Vance *et al.* 2001). This non-floating fruit may be dispersed over water by birds, perhaps the method of colonization of Manitoulin Island (Morton & Hogg 1989). Brunsfeld & Johnson (1990) noted that there was no “notable incidence” of abortion of seeds in western plants of *Crataegus douglasii*, as compared to *C. suksdorfii* which had a high seed abortion rate.

Probable pollinators of *Crataegus douglasii* are bees, according to Tad Dickinson (pers. comm., 2002). In Ontario, it has been observed that the pollen, which is sticky and usually plentiful, is normally gone the same morning that a particular flower opens. Dickinson noted that since bees are the primary visitors to flowers of *C. douglasii*, he assumed bees have removed the pollen and transferred it to the stigmas. Dickinson did not notice any other insects that were frequent or active enough to have removed the pollen. Dickinson noted that when pollination was done by hand on flowers of *Crataegus douglasii*, more seed developed than when open pollination occurred. This suggests that seed production is pollen-limited.

Evans & Dickinson (1996) discuss floral development, including stamen numbers and pollen production, in *Crataegus douglasii* and related species. Flowers of the diploid *C. suksdorfii*, which occurs in the western United States, have 20 stamens, while the tetraploid *C. douglasii* only have 10, due to the absence of a second and third stamen whorl in *C. douglasii* in early

development. *C. douglasii* has about 50% less pollen production per flower than *C. suksdorfii* as could be expected with half the stamen number (pollen production per anther was similar for both species). Since *C. douglasii* flowers earlier than *C. suksdorfii* this could help lessen the disadvantage of having less pollen production than *C. suksdorfii*.

Diploid *Crataegus* species in North America, such as *C. suksdorfii*, are entirely self-sterile (Dickinson & Phipps 1986; Wells & Phipps 1989); however, tetraploid *Crataegus douglasii* plants are self-fertile (set seed when selfed) (Dickinson & Phipps 1986; Smith & Phipps 1988). This self-fertility, which resulted from polyploidization, would have been an advantage to *C. douglasii* before or after the last deglaciation of North America, allowing it to colonize eastward. Because it was a polyploid (4n), it had a greater ecological amplitude and could colonize (more effectively than its diploid relatives) eastward along the shores of past glacial lakes (Dickinson *et al.* 1996).

Members of the genus *Crataegus* can reproduce asexually without a stage in which gametes fuse (gametophytic apomixis). This provides a means by which distinctive genotypes could dramatically increase in numbers at least locally (Dickinson *et al.* 1996).

## POPULATION BIOLOGY AND VIABILITY

In the Great Lakes Region, *Crataegus douglasii* occurs primarily along Lake Superior. It is most plentiful on the Keweenaw Peninsula (Houghton and Keweenaw Counties and Isle Royale). In these areas it can be locally common. Presumably on the Keweenaw Peninsula and on Isle Royale, populations would be considered viable for the long term.

*Crataegus douglasii* is uncommon in Michigan's Pictured Rocks National Lakeshore (Chadde 1996). It is located in a Research Natural Area where visitation is limited and there are no official roads, or trails. Visitor impact would be minimal since few individuals leave the established trails (Bruce Leutscher, pers. comm., 2002).

Previously, several element occurrences were documented at Whitefish Point in Chippewa County, Michigan. One occurrence near the old coast guard buildings at Whitefish Point (Great Lakes Shipwreck Historical Society) was cut down in 1995 to install a power line (Mike Tansy, pers. comm. 2002). Somewhat south of Whitefish Point (on private land within the proclamation boundary of Lake Superior State Forest) several specimens that grew on a breakwater were cut at ground level and the stumps treated with weed-killer; none of these plants have come back (Ed Voss, pers. comm. 2002). Joe Kaplan, a Masters student at Michigan Technological University in Houghton, collected berries from the breakwater site and planted them near the old site at Whitefish Point (J. Kaplan pers. comm. 2003).

Probably one of the more serious threats to *Crataegus douglasii* is the lack of recognition as a rare plant to the untrained eye "it looks like an obnoxious spiny bush" (Ed Voss, pers. comm. 2001). Education is needed to train both agency and private individuals that not all *Crataegus* species are nuisance plants.

The Hiawatha National Forest has one site at the Bay Furnace campground. The site is in a camping area adjacent to the road. Deb LeBlanc (pers. comm. 2002) felt that the multi-stem shrub may have already been cut back when work occurred at the campground site and the

spur roads. Any potential human actions are a threat. Campground maintenance crews, concessionaires, or campers could inadvertently impact this plant; educational signage might be appropriate at this site (Deb LeBlanc pers. comm. 2002).

In 1984, one of the two known locations of *Crataegus douglasii* in Minnesota, harbored sufficient plants to be considered viable (Coffin and Pfannmuller 1984). There are now 15 known documented sites in Minnesota with most sites having less than 20 individuals (MN HNP 2000). All of these sites are within 2-3 miles of Lake Superior (USDA 2000b). More recently Lawson Gerdes (pers. comm., 2002) noted that at least one site has been found about 5 miles from the shore. Nine of these 15 sites are within the proclamation boundary of Superior National Forest (Ed Lindquist, pers. comm., 2002), but few of these nine sites are on Superior National Forest land. Although the proclamation boundary goes to the Lake Superior shore, most of the Superior National Forest land is not that close to the shore (Mary Shedd, pers. comm., 2002). Therefore, according to USDA (2000b), *C. douglasii* is “not viable on Superior National Forest because most of locations are within 2-3 miles of Lake Superior and that is where the stronghold of populations will likely remain.”

## **Propagation**

The following information about seed propagation most likely refers to seeds obtained from western *Crataegus douglasii*. The taxon *C. douglasii*, used in some of the references cited below, may include other related taxa (*C. suksdorfii* and *C. rivularis*). Seeds obtained from disjunct plant populations in the northern Great Lakes may or may not have the same requirements for germination, etc. as described below.

Growing plants of *Crataegus douglasii* in full sun is best for fruit production and requires from 5-8 years before fruit is produced (W-4). Before propagating seed, the pulp must be removed. Several methods of pulp removal are described by Rose *et al.* (1998). Because of embryo dormancy, seeds of *Crataegus* species need a period of cold-stratification before germination is successful (Young & Young 1992).

Germination of seeds may be attempted with fresh or stored seeds. When “green” seeds (embryo is mature, but seed coat has not hardened) of *Crataegus douglasii* are sown in a cold frame in the fall, germination is quicker (it can germinate the next spring) and more dependable than when seeds have been stored (W-4). Another method to possibly decrease germination time, is to soak the seeds in its own fermenting pulp (W-4). In order to propagate stored seed various treatments may be used to increase the rates of germination, including seed scarification (acid and mechanical), prechilling, and warm stratification (Young & Young 1992; W-5). Before storing seed, the seed should be completely air dried. Air-dried seeds are viable for up to three years when stored at 5°C (=41°F) [Rose *et al.* 1998].

In addition to propagation by seeds, *Crataegus douglasii* shrubs can be transplanted, most successfully after three years of age, with frequent watering (Vance *et al.* 2001). Many of these greenhouse experiments were conducted in western states with western seed, so somewhat different results might be obtained from greenhouses in the Great Lakes Region.

## **POTENTIAL THREATS**



## Western United States

Cattle, sheep, and horses are known to graze on *Crataegus douglasii* in various western states (Habeck 1991). [Habeck (1991) includes the three varieties (var. *douglasii*, var. *suksdorfii*, and var. *rivularis*) in the taxon *C. douglasii*.] One study in Montana showed that 50% or more of the stems of this species were eaten by cattle (Pierce & Johnson 1986). In western states, *C. douglasii* may be damaged by uncontrolled fire, although as with grazing, injured plants may resprout (Habeck 1991).

These potential threats to western plants of *Crataegus douglasii* likely do not apply to *C. douglasii* plants in the northern Great Lakes Region.

## Great Lakes Region

Potential threats to *Crataegus douglasii* plants of the northern Great Lakes Region are discussed below. Potential threats include insect infestations, succession, cutting back or destroying plants in recreational areas, trampling by hikers, and various hazards due to timbering and related slash piles.

In Minnesota and Michigan populations of *Crataegus douglasii*, various insects have been known to infest plants. For example, in 1956 a severe aphid infestation affected several Minnesota plants (Coffin & Pfannmuller 1988). In Michigan, insects ate about 70% of the leaves on one clump of *C. douglasii* (Gerdes & Saltzmann 1995). In 2001, an extreme infestation of tent caterpillars [eastern tent caterpillar (*Malacosoma americanum*) and/or forest tent caterpillar (*M. disstria*)] attacked many trees and shrubs, including many Rosaceae such as *C. douglasii*, in Michigan's Houghton County (Dana Richter, pers. comm., 2002). Some shrubs had almost all of their leaves eaten off, although later in the season, new leaves appeared on some trees (Janet Marr, pers. comm., 2002). According to Dana Richter (pers. comm., 2002), neither species of tent caterpillars will kill trees or shrubs, but will impact their growth. In Canada, complete defoliation and a large decrease in fruit production in *Crataegus* species resulted from infestations of tent caterpillars (*Malacosoma americanum*) (Phipps & Muniyamma 1980).

Although beavers chewed stems of *Crataegus douglasii* growing along some of the Minnesota tributaries flowing into Lake Superior, the plants tended to resprout from the base (Lynden Gerdes, pers. comm., 2002). Gerdes also noted that some *C. douglasii* plants are within the flowage of streams in the spring, and are likely impacted by river current debris that could damage the stems.

A natural threat to plants of *Crataegus douglasii* is succession. As shading by other canopy trees increases, *Crataegus* species quit flowering and become weak and die (Phipps & Muniyamma 1980). Two clumps of *C. douglasii*, in Michigan's Houghton County, looked particularly scraggly, and appeared to be shaded out by taller shrubs (*Alnus incana* var. *americana* and *Sorbus* sp.) which were growing near-by (Janet Marr, pers. comm., 2002).

Because of their thorns (if the species rarity is not recognized), *Crataegus douglasii* may be cut back in recreational areas, and along trails as in some Minnesota State Parks (USDA 2000b). In addition, two sites near Whitefish Point (in Chippewa County of Michigan's

Upper Peninsula) were destroyed (Ed Voss, pers. comm., 2001). One was cut down when a powerline was installed and the other was cut down and the stumps treated with weed-killer. Voss (pers. comm., 2001) contends that a major threat to this species is ignorance. He stresses that there is a need to “educate landowners and agency managers who have this species in their jurisdiction--as to how to recognize it, to understand that this is not just an obnoxious spiny bush, and that it needs protection!”.

Most of the 15 Minnesota element occurrences are on public land, but these sites “are not necessarily better protected than occurrences on private land, since most of the public land is managed for timber production which is a major threat to *Crataegus douglasii*” (Welby Smith, pers. comm., 2002). Timber harvest could result in several negative impacts such as trampling or machinery crushing the stems of *C. douglasii* clumps. Other hazards include slash being piled on this low growing shrub, herbicide application which often accompanies replanting, and increased erosion and siltation. Timber harvesting also causes changes to the microclimate. Increased competition from released understory trees and shrubs could crowd it out, and increased sunlight could dry out the soil and kill it (Welby Smith, pers. comm., 2002). This species tends to grow along borders, such as trail and road edges; therefore, there is a chance that off-road recreational vehicles (ORVs) might run over younger plants of this species (USDA 2000b).

## MONITORING RESEARCH

In Michigan’s Pictured Rocks National Lakeshore, there is no active program to determine the extent of populations of *Crataegus douglasii* in the park or any monitoring program in place (Bruce Leutscher, pers. comm., 2001). There may not be any monitoring programs for this species within the Great Lakes area; no reference was found indicating such work.

In addition to establishing long-term monitoring sites for *Crataegus douglasii*, research is needed on almost every aspect of the biology, including pollinator identification, and ecology. This is especially important for disjunct *Crataegus douglasii* plants occurring in the northern Great Lakes Region. Studies focusing on specific habitat requirements such as optimal light levels, role of disturbance in establishment, nutrient and substrate requirements would be especially useful. Identifying potential threats specific to *C. douglasii* plants and populations in the Great Lakes Region is needed. Locating new populations is important as is notifying landowners or managers as to the presence of this species and its rarity so as not to accidentally clean it out of fence rows or other areas.

## SUMMARY

The main range of *Crataegus douglasii* is in the western United States, with disjunct populations in the northern Great Lakes Region occurring in Michigan, Minnesota, and Ontario (Gleason & Cronquist 1991), and a possible introduction in Wisconsin (Judziewicz & Koch 1993). This species is designated as a Regional Forester Sensitive Species on the Hiawatha and Superior National Forests (USFS 2000a), is listed as threatened in Minnesota and Special Concern in Michigan. Michigan has 109 EOs, but less than half are later than 1950 (Ed Schools, pers. comm., 2002) Minnesota has 15 EOs (MN HNP 2000)].

Potential threats to *Crataegus douglasii* in the northern Great Lakes Region include, but are not limited to, succession, insect infestations, and failure to identify this thorny shrub as a rare species often leading to its subsequent destruction.

Long term monitoring of individuals of *Crataegus douglasii* in the northern Great Lakes is needed, as is research on various aspects of its biology and ecology, including specific habitat requirements.

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## CONTACTS

### National Forests

Hiawatha National Forest, Michigan: Jan Schultz, Forest Plant Ecologist 906-228-8491;  
Linda Swartz, Botanist 906-643-7900; Janet Marr, Contract Botanist 906-337-5529  
Superior National Forest, Minnesota: Mary Shedd 218-365-7616; Ed Lindquist  
218-626-4380; Jack Greenlee (218) 229-8817  
Eastern Region (R9), Milwaukee, Wisconsin: Nancy L. Berlin (218) 335-8673  
Library Services, N. Central Research Station: Laura Hutchinson  
[Lhutchinson@fs.fed.us](mailto:Lhutchinson@fs.fed.us)

### Other

Black, Merel: University of Wisconsin at Madison, Botany Dept., Herbarium  
[mblack@facstaff.wi](mailto:mblack@facstaff.wi)  
Dickinson, Tad: Center for Biodiversity and Conservation Biology, Royal Ontario  
Museum and Department of Botany, University of Toronto,  
[TIMD@ROM.ON.CA](mailto:TIMD@ROM.ON.CA)  
Gerdes, Lawson: Minnesota County Biological Survey,  
[lawson.gerdes@dnr.state.mn.us](mailto:lawson.gerdes@dnr.state.mn.us)  
Gerdes, Lynden: Minnesota County Biological Survey, [lynden.gerdes@dnr.state.mn.us](mailto:lynden.gerdes@dnr.state.mn.us)  
Judziewicz, Emmet: U/W at Stevens Point (formerly with Wisconsin DNR, Bureau of  
Endangered Species)  
Kaplan, Joe: Michigan Technological University, Houghton, Michigan 906-487-3059  
Leutscher, Bruce: Pictured Rocks National Lakeshore 906-387-2607  
Morse, Larry. NatureServe 703-908-1884; [larry\\_morse@natureserve.org](mailto:larry_morse@natureserve.org)  
Richter, Dana: Michigan Technological University [dlrichte@mtu.edu](mailto:dlrichte@mtu.edu)  
Schools, Ed: Michigan Natural Features Inventory (MNFI), Lansing, MI  
[schoolse@michigan.gov](mailto:schoolse@michigan.gov)  
Smith, Welby: Minnesota Natural Heritage and Nongame Research  
[welby.smith@dnr.state.mn.us](mailto:welby.smith@dnr.state.mn.us)  
Tansy, Mike: Seney National Wildlife Refuge 906-586-9851  
Voss, Ed: botanist, University of Michigan herbarium [egvoss@umich.edu](mailto:egvoss@umich.edu)